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L3 Stress-Scanning Diffractometer

Although the L3 spectrometer was designed as a triple-axis instrument, it is now always used in diffraction mode for commercial measurements and Materials Science research. In this capacity, most of L3 beam time is used for strain/stress mapping. L3 can also be equipped with a stress rig for examining specimens under uniaxial load. For strain/stress mapping, a large variety of slit dimensions are available. L3 can also be equipped with a variety of sample orientation devices.

L3 is always equipped with a 32-wire position sensitive detector. Wire spacing is 2 mm which at L3 corresponds to ~0.08°. This detector can also be used as a variable-width single-channel detector.

Typical Experiments

- residual strain/stress mapping
- crystallographic texture
- grain-interaction stresses
- precipitation and phase transformations

Ancillary Equipment Specifically Available to L3

- Large capacity x-y table that can handle loads of up to 450 kg (1,000 lbs.) and provides a large 60 cm × 60 cm (2″ × 2″) platform for easy mounting (including multiple samples). Various other translation and rotation devices (see general ancillary equipment) can be easily added to the table.
- Stress Rig-for examining specimens under uniaxial load (tension and compression). The stress rig can be used for the determination of diffraction elastic constants for which the rig can be placed on the spectrometer in both the Young's and Poissonorientations. Maximum applied load is 45 kN (5 tons).
- Strain collimators: A large variety of slits and height limiters are available for defining the sampling volume for residual strain/stress mapping experiments.
- An Eulerian Cradle can be installed on L3 for full control of sample orientation. The addition of the cradle effectively transforms L3 into a 4-circle diffractometer. Primarily used for crystallographic texture and grain interaction measurements, but also useful for examination and pre-alignment of single-crystals.

Technical Specifications

Beam Size at sample position: 7.5 cm high × 5 cm wide (maximum)

Available monochromomators and analyzers:

- Be, Cu, Ge, graphite, Si available (these monochromating and analyzing crystals are shared among the spectrometers, several crystals of each type are available).

Monochromator take-off Angle: Continuously variable from 0 – 105°

Specimen scattering angle: Continuously variable from 0 – 120°

Collimators:

No source-to-monochromator collimator is installed, effective collimation is ~ 0.9 deg. The remaining beam segments have adjustable soller slits with each soller channel having a minimum blade spacing of 0.050″. Soller blades are available in 26″, 19″, 14.5″, 8.0″ and 5.5″ lengths. The maximum blade length in each beam segment are:

- monochromator to specimen, 26″
- specimen to analyzer, 14.5″
- analyzer to detector, 8″

Detector:

The standard configuration of L3 uses a 32-wire position sensitive detector. This detector can also be used as a variable-width single detector. When required, a true single detector can be installed.